

## CLAIMS

1. A process for preparing an aqueous polymer dispersion by mini-emulsion polymerisation, the process comprising the steps of

5 (a) forming a mixture comprising::

(i) water;

(ii) at least one amphiphilic stabilising polymer of number average molecular weight ( $M_n$ ) from about 800 to about 100,000 daltons and an acid number from about 50 to about 400 mg KOH/g;

10 (iii) at least one hydrophobic co-stabiliser; and

(iv) at least one  $\alpha,\beta$ -ethylenically unsaturated monomer;

where the mixture comprises no more than about 2% by weight of the monomer of the total amount of any further ingredient(s) which act as a surfactant in the mixture;

15 (b) applying high stress to the mixture from step (a) to form an essentially stable mini-emulsion comprising an aqueous continuous phase and dispersed therein stabilised droplets of average diameter from about 10 to about 1000 nm, the droplets comprising the hydrophobic co-stabiliser and the monomer

(c) polymerising the monomer within the droplets.

20 2. A process according to the preceding claim, in which in step (a) the mixture is formed by mixing a first (aqueous) pre-mixture comprising the amphiphilic stabilising polymer and water with a second (organic) pre-mixture comprising the hydrophobic co-stabiliser and the  $\alpha,\beta$ -ethylenically unsaturated monomer.

25 3. A process according to claim 2, in which a polymerisation initiator is incorporated (optionally dissolved) in the second pre-mixture.

4. A process according to any preceding claim where the amphiphilic stabilising polymer is a polymer derived from a combination of hydrophobic monomers and  
30 hydrophilic monomers which comprise acid functions or functions leading thereto.

5. A process according to any preceding claim, where the amphiphilic stabilising polymer comprises copolymer(s) derived from styrene and maleic anhydride and/or from styrene,  $\alpha$ -methyl styrene and acrylic acid.

6. A process according to any preceding claim, where the amphiphilic stabilising polymer has a solubility in the aqueous phase measured at 25°C of at least about  $1 \times 10^{-2}$  g/l.
- 5 7. A process according to any preceding claim, where the amount of amphiphilic stabilising polymer used is from about 0.5% to about 15 % by weight relative to the total weight of  $\alpha,\beta$ -ethylenically unsaturated monomer(s).
8. A process according to any preceding claim, where the hydrophobic  
10 co-stabiliser has a solubility in water, measured at 25°C, of less than about  $5 \times 10^{-5}$  g/l.
9. A process according to any preceding claim, where the hydrophobic co-stabiliser is selected from the group consisting of:  $C_{12-14}$ alkanes,  $C_{12-14}$ alcohols,  $C_{18-22}$ acrylates and mixtures thereof.
- 15 10. A process according to any preceding claim, where the hydrophobic co-stabiliser is used in an amount from about 0.05% to about 40% by weight based on the total weight of the mixture prepared in step (a).
- 20 11. A process according to any preceding claim, where the  $\alpha,\beta$ -ethylenically unsaturated monomer has a solubility in water, measured at 25°C, of less than about 15%.
12. A process according to any preceding claim, where the  $\alpha,\beta$ -ethylenically  
25 unsaturated monomer is selected from the group consisting of: styrenes, acrylates, methacrylates, vinyl and vinylidene halides, dienes, vinyl esters and mixtures thereof.
13. A process according to any preceding claim, where one or more water-soluble monomer(s) having a water solubility, measured at 25°C, higher than about 15% are  
30 added to the mixture of step (a) in an amount less than about 6% by weight of the total monomer(s).
14. A process according to any preceding claim, where one or more components that modify the pH are added to the mixture formed in step (a).

15. A process according to any preceding claim, where step (b) produces a mini-emulsion comprising stabilised droplets having an average diameter from about 50 nm to about 500 nm.
- 5 16. A process according to any preceding claim, where the high stress in step (b) is applied by equipment that produces localised high shear, optionally in combination with moderate bulk mixing.
17. A process according to any preceding claim, where the monomer within the  
10 droplets is polymerised in the presence of a free radical initiator.
18. A stable aqueous polymer dispersion obtained and/or obtainable indirectly and/or directly by a process as claimed in any preceding claim.
- 15 19. A stable aqueous polymer dispersion comprising a matrix of polymer particles formed from at least one  $\alpha,\beta$ -ethylenically unsaturated monomer, the particles having an average diameter from about 10 to about 1000 nm, and homogenously dispersed with the polymer matrix there is: (i) at least one amphiphilic stabilising polymer of number average molecular weight ( $M_n$ ) from about 800 to about 100,000 daltons and  
20 an acid number from about 50 to about 400 mg KOH/g; and (ii) optionally at least one hydrophobic co-stabiliser; where the polymer matrix:
20. Use of a polymer dispersion as claimed in either claim 18 or 19 to prepare a coating; film, adhesive and/or ink composition.
- 25 21. A coating; film, adhesive and/or ink composition obtained and/or obtainable using a polymer dispersion as claimed in either claim 18 or 19.